

Bill Nye the Science Guy

Probability



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Implementation Guide

*Welcome to Disney's Bill Nye DVD collection!
With the help of this Guide you can bring instructional
DVDs into your math curriculum.*



What's on the DVD?

Bill Nye DVDs expand the educational features of *Bill Nye the Science Guy* programs. Each DVD provides students with science content through video clips aligned with *Principle and Standards for School Mathematics (PSSM)* and a host of other resources.

Short video clips aligned with the (PSSM) provide a unique opportunity for you to enhance your lessons using DVD technology. Now you can show a video clip, or even short segments of a clip, on command. But there are a host of other features, too! See the chart below for a summary.

From the **Main** menu, there are three chief sections:

Feature	Description
Watch Program Menu	From this menu, you can play the program straight through or use the clips to customize your viewing.
Teacher Support	From this menu, you can access this Teacher's Guide, the Glossary, Internet Links, and the Quiz.
Bonus Materials	Use this menu to try a different discussion starter, download a special screen-saver, or check out never-before-seen footage.

From the **Watch Program** menu, you can:

Feature	Description
Play Program	Play the entire program from start to finish.
Bilingual Mode	View the entire program or clips in English or Spanish.
Glossary Mode	Make links to Glossary terms appear during the program.
Program Overview	View the program introduction, in which Bill discusses the topic covered.
Try This	Show students demonstrating science concepts.
Bill's Demonstration	Look at a demonstration conducted by Bill Nye.
Music Video	Enjoy a short music video that summarizes the topic in an age-appropriate and entertaining manner.
Math Standards	Take advantage of short video clips from the program, which are aligned with Principles and Standards for School Mathematics.

From the **Teacher Support** menu, you can:

Feature	Description
Quiz	Give students a quiz to take independently or as a class. Ten quiz items are aligned with national standards. The items are in multiple-choice or true-false format. Each wrong answer links to a standards-aligned video clip. At the end of the quiz, a scoring function reveals the number of correct initial answers.
Glossary	Check out definitions of key terms and view video clips that reinforce the concepts.
DVD Features	View a quick overview of the features found on the DVD.
Teacher's Guide	Print out or view this comprehensive Teacher's Guide in PDF format.
Internet Link	Link to the Bill Nye area of Disney's Edustation Web site, where you can find links to Internet sites related to the content of each Bill Nye program.

From the **Bonus Materials** menu, you can:

Feature	Description
Bonus Material	Find out what <i>wasn't</i> in the episode! In most cases, there's more of the Way Cool Scientist interview, Bill Nye outtakes, and an extra discussion starter.
Additional Clips	See trailers of related DVDs and videos.
Screen-Saver	Download this cool screen-saver for your computer.

The Planning Process

This Guide provides a Lesson Planning Worksheet (see page 17), which can assist you in setting up your instruction around a topic. The following sections of this Implementation Guide are offered to assist your planning process:

- **Determining Objectives and Linking to Standards**
- **The Learning Cycle**
 - Explore
 - Apply
 - Extend
 - Assess



Determining Objectives and Linking to Standards



1. Select content and adapt and design activities to meet student interest. The PSSM Teaching Principle states that “Selecting and using suitable curricular materials, using appropriate instructional tools and techniques...are actions good teachers take everyday.” The Principle goes on to state that, “Teaching mathematics well involves creating, enriching, maintaining, and adapting instruction to move toward mathematical goals, capture and sustain interest, and engage students in building mathematical understanding.” The Bill Nye DVD provides good mathematical content in a fun and engaging way for students of all ages.

Each DVD contains a menu of clips that are Math aligned with PSSM. You can review the standards and their aligned clips in the Standards menu under Watch Program. Also, the Standards listed on page 10 of this Guide allow you to look at additional PSSM content standards that are addressed on the video. Since most state and local standards documents were derived from the PSSM, you will find that your local and state standards match closely with content standards in the Bill Nye DVD. Here's an example of the content standards and clips aligned with the Bill Nye DVD entitled *Measurement*:

Mathematics Standards (PSSM) Addressed in Measurement

Measurement:

Understand measurable attributes of objects and the units, systems, and processes of measurement

- Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems.

Aligned clips:

- 1 Great moments in measurement
- 2 A meter is a meter wherever you are

- Understand relationships among units and convert from one unit to another within the system.

Aligned clips:

- 3 A meter to a liter to a kilogram
- 4 Meter/centimeter/millimeter/micrometer

Apply appropriate techniques, tools, and formulas to determine measurements.

- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.

Aligned clips:

- 6 Construction and airplane manufacturing
- 7 Bridge



2. Determine your objectives for the lesson and how these objectives address the standards.

Sample Objectives for *Measurement*

In this activity students will:

- Compare the origin of the metric system with the customary system.
- Distinguish between standard and nonstandard measurements.
- Explain how meters, liters, and kilograms are related.
- Define the metric prefixes as based on powers of ten.
- Convert from one unit to another within the metric system.
- Measure length, volume, and mass of common objects using appropriate units.

3. Design a learning cycle of instructional experiences and assessments for the students to engage in that will help students meet these standards. Students may be given teacher-planned investigations or may be guided to design their own investigations.

The Learning Cycle



The learning cycle is a sequence of activities that involve students in the learning process. The sequence found here is based on research from Lawson, Abraham, and Renner published in 1989. That has been adapted to include: Explore, Apply, Extend and Assess:

Explore: Involves assessing students' prior knowledge and providing opportunities for students to interact with content from the video.

Apply: Includes having students use the content learned during the Explore section in a new way that is meaningful to future learning.

Extend: Allows students to conduct further research around an area of interest within the topic.

Assess: Provides strategies meant to inform students and teachers about the content and processes that have been learned.

Explore

The PSSM Teaching Principle states that, "Effective teaching requires a challenging and supportive classroom learning environment." In an ideal mathematical setting, students are able to think, ask questions, solve problems, and discuss solutions with their fellow classmates and the teacher. Teachers should provide students with worthwhile mathematical tasks in a way that is intriguing to all and challenging for students with different levels of ability. Mathematics teachers need to make decisions about when and how to provide information, and "how to support students without taking over the process of thinking for them." Knowing the best time to intervene is often determined by allowing students to ask questions and to explore concepts openly.





Assess in Order to Guide Teaching: The Program Overview or the Discussion Starter on the DVD can be used to gauge students' prior knowledge. You can use student responses to make decisions about appropriate instruction and adaptations in order to meet the needs of individual students. Assessment can be in the form of student reflections from standards-aligned video clips or answers to questions found on the science quiz. Or, as in the following example, a simple graphic organizer can facilitate a formative assessment.

Example: Graphic Organizer (page 19) from *Measurement*

1. Explain to students that as they watch clips of the Bill Nye DVD Measurement, they will be filling in a graphic organizer. Begin by having the student place a circle in the middle of a piece of paper with the phrase "metric system" in it. The circle should have two or three "spokes" coming out of it.
2. Explain to students that as they watch a clip, they should display information on the wheel in a way that makes sense to them .
3. Students can then color code their graphic organizer so that one color represents what they already know about the metric system (e.g., meter, liter, gram, etc.) and another color represents new things they have learned from watching the video clip (e.g., how a meter was first determined, etc.) Replay the clip as necessary to allow students to review sections of interest.
4. Once students have completed their graphic organizers, ask them to share what they coded as "new" information. Write these on the board. Have students write their own "working" definition of the metric system. Once students have completed their definitions, collect and review their work to assess prior knowledge.

Conduct direct vocabulary instruction in the Explore phase. Research suggests that:

- Students must encounter words in context more than once to learn them.
- Instruction in new words enhances learning those words in context.
- One of the best ways to learn a new word is to associate an image with it.
- Direct vocabulary instruction on words that are critical to new content produces the most powerful learning.



Use the DVD Glossary with the linked video clips to expose students to new vocabulary words in context, along with associated video images. You can also find a printed version of the glossary terms in this Guide on page 22.

Example: Using the Glossary for Direct Vocabulary Instruction **Measurement**

1. Present students with a brief explanation or description of the new term or phrase from the glossary. For example: "Hodometer: a measuring wheel that was an instrument used in ancient Rome to measure distance traveled or mileage."
2. Present students with a nonlinguistic representation of the new term or phrase. Show the video clip associated with the term "hodomometer."
3. Ask students to generate their own verbal description of "hodomometer."
4. Ask students to create their own nonlinguistic representation of "hodomometer."
5. Periodically ask students to review the accuracy of their explanations and representations.

Apply

"In planning individual lessons," the PSSM Curriculum Principle states that "teachers should strive to organize the mathematics so that fundamental ideas form an integrated whole. Big ideas encountered in a variety of contexts should be established carefully, with important elements such as terminology, definitions, notations, concepts and skills emerging in the process." Based on the information that you gained from the Explore assessments, design appropriate activities for your students. Check the experiments listed in the Episode Guide (see page 12) for explanations of the demonstration from the Bill Nye program as well as for additional experiments designed to help apply the knowledge gained.

In the following example from Measurement the standards based video clips are used to provide background information to the students.

Example: Understanding Relationships Among Units

1. Have students begin a graphic organizer with the word "Unit" in the circle, focusing on what they already know about units of measurement.
2. Watch the following chapters from the Bill Nye DVD *Measurement*:
 - A meter to a liter to a kilogram
 - Meter/centimeter/millimeter/micrometer
3. Complete the graphic organizer with new information from the clips.
4. Give students copies of the Student Problem Solving Sheet (see page 20) and have them fill the sheet out as they conduct their activities.
5. Do the activities entitled "What's a Centimeter on You?" and "How Much Can it Hold?" from the Measurement Episode Guide.
6. Write down any remaining questions that students have about units of measurements.



Extend

Identify and Use Resources Outside of the School: “The school program must extend beyond the walls of the school.” Each Bill Nye DVD contains resources designed to facilitate such understanding, including:

- Way Cool Scientist, found in both Watch Program and Bonus Materials, in which scientists discuss their current areas of study. This real-world connection often results in a deeper student understanding of a particular career.
- Disney’s Edustation Web site, where relevant Internet links provide a starting point for students to further explore topics.
- Try these video clips, with activities parents and students can do at home. The questions generated by students from these experiences can be used as foundations from which they may conduct their own research.
- Standards-aligned video clips and Bill’s demonstration video clips, which can help generate topics for further research. After viewing the clips, have students list their questions, perhaps about the most current developments in a topic. By conducting online or library research, students will find answers to their questions and will learn about a topic in greater depth.



“Problem solving is central to inquiry and application and should be interwoven throughout the mathematics curriculum to provide a context for learning and applying mathematical ideas” (NCTM, 2000). Challenging problems should be based on student interests and abilities so they explore mathematical concepts that are relevant to their lives. In the following example, students use measurement skills to solve a real life problem of local interest.

Example: Example: How Long Does it Take to Get Across My State?

Pose the question above to your students. Explain that their job will be to determine how long it would take to traverse their state using a chosen mode of transportation. Students may choose from a variety of modes including, “walking”, “skateboarding”, or “riding a bike.” Ask students for ideas of how to solve this problem without actually “going the distance.”

Depending on their travel mode choice, students can use a stopwatch and a tape measure to determine the average speed they might go using their chosen mode. (This might need to be done as a homework assignment.) Using a map students should determine the route across the state they would like to take. Allow students to use many different routes. To vary the distances, suggest that students work with a state where they were born, or where they have once lived. Alternatively, students could expand this assignment to entire countries. Or the title could be changed to “How long does it take to get out of my state from my hometown?” for a real local context.

Once students have determined the time it would take to cross the state using their chosen mode, ask them to reconsider their answer and make it more realistic by adding time for sleep, rest, eating, etc. Instruct students to provide a rationale for these additions on the Student Problem Solving Sheet (page 20).



Assess

Once students have solved the problem, you may choose to assess them in a number of different ways:

- By having students write about what they learned in a journal.
- By having students submit projects or reports.
- By having students take the program quiz to gauge their understanding of certain facts in the video. You can either print the quiz (found in this Guide on 23) and have each student complete it individually or use the DVD screen version and the scoring feature for whole-class assessment.
- By designing other standards-aligned questions to augment those that are provided.

While the quiz will provide you with information about what the students have learned, it does not assess how students have processed the information. Below you will find assessment ideas that can be used to measure both content and process.

A Sample Assessment

1. Explain to students that an important aspect of mathematics is communication. Tell students that they will write a short report on their problem from (How Long Does it Take to Get Across My State?) including:
 - The state and mode of transportation you chose including illustrations
 - The method that was used to find solutions to the problem
 - Mathematical calculations for solving the problem
 - Solution(s) to the problem
 - Additions to your solution to make it more realistic
 - Rationale for these additions
2. Distribute the rubric found in the Lesson Planning Worksheet (see page 17) to students so they know how they will be assessed. Make sure that students understand the criteria found in the rubric. Before you begin you may want to allow students to make changes to the rubric so that it is more clear or makes more sense from the their perspectives.

Allow students time to prepare their report. As students complete the report, walk around the room and ask questions to assess their progress and provide input as needed.

Congratulations! You have now completed the steps to set up a lesson plan using the Lesson Planning Worksheet. You have also explored many of the features of the Bill Nye DVD as well as the supplemental information found in this Teacher's Guide. And most important, you've made significant strides toward incorporating DVD technology into your day-to-day instruction.



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Principles and Standards for School Mathematics (NCTM)



Probability

Standards/Benchmarks



Number and Operations Standard

Understand numbers, ways of representing numbers, relationships among numbers, and number systems

- Understand and use ratios and proportions to represent quantitative relationships

Algebra Standard

Understand patterns, relations, and functions

- Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules;
- Relate and compare different forms of representation for a relationship;

Use mathematical models to represent and understand quantitative relationships

- Model and solve contextualized problems using various representations, such as graphs, tables, and equations.

Geometry Standard

Use visualization, spatial reasoning, and geometric modeling to solve problems

- Use visual tools such as networks to represent and solve problems;
- Use geometric models to represent and explain numerical and algebraic relationships;
- Recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life.

Data Analysis and Probability Standard

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

- Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population;
- Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatterplots

Understand and apply basic concepts of probability

- Understand and use appropriate terminology to describe complementary and mutually exclusive events
- Compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models

Select and use appropriate statistical methods to analyze data

- Find, use, and interpret measures of center and spread, including mean and interquartile range;

Develop and evaluate inferences and predictions that are based on data

- Use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken;

Problem Solving Standard

- Solve problems that arise in mathematics and in other contexts;

Reasoning and Proof Standard

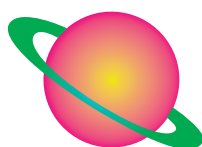
- Make and investigate mathematical conjectures;

Connections Standard

- Recognize and use connections among mathematical ideas;
- Recognize and apply mathematics in contexts outside of mathematics.

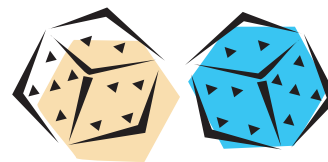
Representation Standard

- Create and use representations to organize, record, and communicate mathematical ideas;
- Select, apply, and translate among mathematical representations to solve problems;
- Use representations to model and interpret physical, social, and mathematical phenomena.



Episode Guide

Probability



Synopsis

In *Bill Nye the Science Guy: Probability*, Bill Nye examines the use and functions of probability in daily life. When invited into the wacky lab of Bill Nye, we begin to understand that luck and chance are really a mathematical predictability. Probability is important in the sciences, used in the world of business, and of course is a big part of many games. Bill Nye demonstrates probability in action from throwing the dice and tossing a coin to winning the lotto or finding a four leaf clover.

The student will:

- be introduced to the concept of probability and statistics;
- recognize the application of probability and statistics as it relates to science, games, business, and many aspects of daily life; and
- become acquainted with several equations and processes of using probability.

Background Information

Probability is the numeric value (from 0 to 1) associated with the likelihood of an event occurring with some particular outcome. Any outcome of any event one can imagine may happen, or it may not happen. The possible outcomes of an event may be classified as favorable or unfavorable. If the probability of the favorable outcome of an event is close to 0, the event is not very likely to happen favorably. If the probability of an event is close to 1, the event is very likely to happen favorably.

An event is the outcome of something happening, for example, a coin landing heads up after being flipped. The theoretical probability of an event may be calculated by dividing the number of favorable outcomes by the total number of possible outcomes.

$$\text{Probability of an event} = \frac{\text{\# of favorable outcomes}}{\text{\# of possible outcomes}}$$

$$\text{Probability of coin landing on heads} = \frac{1}{2}$$



The *empirical probability* (or what actually happens on each coin flip) may be calculated by dividing the number of times the outcome of a repeated event is favorable by the number of times the event occurs. If the number of repetitions is large enough, the empirical probability will be close to the theoretical probability.

The probability of all the favorable outcomes of an event plus the probability of all the unfavorable outcomes adds up to 1 (or 100%).

Percent is a way of writing a fraction in which the denominator is 100. For example, $\frac{1}{4}$ is $\frac{25}{100}$ is 25%. If the probability of the favorable outcome of an event is 50%, then $\frac{1}{2}$ of the total possible outcomes are favorable. For example, if heads is the favorable outcome of flipping a coin, then the probability of heads is 50%. (Heads is one of the two possible outcomes.)

Average (arithmetic average or mean) is the a calculated by dividing the sum of a set of numbers by n , the number of numbers in the set. If the numbers are grouped in intervals and the frequency of the numbers in each interval is graphed against the interval centers, the graph provides a useful picture of the data. Sometimes the distribution is a bell-shaped curve, and the mean is the number that splits the curve into two equal areas.

Mutually exclusive events are two events that cannot happen at the same time. For example, when rolling a die, rolling a 3 and rolling an even number are mutually exclusive events. To find the probability of two mutually exclusive events, add the probabilities. The probability of rolling a 3 is $1/6$, of an even number $1/2$. When added together $1/6 + 1/2 = 2/3$.

Preview Questions



- What is probability? (The chance of something happening or not happening.)
- How often do you think we use probability in our daily lives?
- Is it possible to mathematically calculate the chances of something happening, for example, rolling a 6 on a die, or is it just luck?
- What is an average? (median, mode, mean)
- In what areas, other than math, is probability used?
- If you flip a coin, what are the odds that it will land on heads? If you roll a pair of dice, what number will come up most often? Why?

Post Viewing Questions

- In what ways is probability part of your daily life?
- Why is probability important?
- What increases the probability of something happening? (Fewer combinations.) What decreases the probability of something happening? (More combinations.)
- What does determining an average enable you to do? (Makes it easier to predict an outcome.)
- What does the shape of a bell curve demonstrate? (The distribution of results. The things on the end of the curve occur less often and the things closer to the center occur most often.)
- The number 7 is considered “lucky” by many people. How is “luck” really a mathematical probability when it comes to rolling the number 7 with dice?
- How would you explain the difference between luck and probability?

Suggested Activities

1. Marble Probability

Give each pair of students a brown paper bag with marbles of various colors. (The proportions of the colors should be different.) Player A selects one marble from the bag at a time, notes the color on the tally sheet and places the marble

back into the can. Player B does the same, noting results. This process is repeated until each player has recorded 10 tallies.

Based on this preliminary information, players then attempt to guess how many marbles of each color are in the bag. Players continue to select marbles, note and revise their predictions. After they have drawn up to 50 times, students should compare their findings and predictions with the actual information.

This activity can be continued by altering the total number and specific colors in the bag.

2. Edible Research

Give groups of 2 or more students a package of multi-colored candies. Each "team" will predict and note outcomes to the following questions:

- What colors are in the package?
- How many candies do you think are in the pack?
- What do you think the distribution of colors will be?
- Do you think that all packages of this candy are the same?



Students should then open the packs of candy and compare actual results with their predictions. Students should compare their results with the findings of another team. Based on the actual outcome, have teams determine the probability of selecting a specific color or a series of colors.

3. The Probability of Being a Lefty!

Before the activity, have students guess the percentage of left-handed people in the class. Note their prediction. Take a survey and graph the handedness of the students in the classroom.

Calculate the following:

- Ratio of right- to left-handedness.
- Percentage of class that is left-handed.



Nationally, the ratio of left- to right-handed students is 1:6 or 16% of the population. Does this agree with your findings?

As a follow up, have students survey other classrooms to collect additional information to increase the sample base.

4. How Long to a Million?

This activity allows students to predict an outcome based on a sample of research. Divide students into groups. Each group will need a calculator and a stop watch. Propose the following question to each of the groups: "How long do you think it would take a person to count to a million?" Have the students record their estimates for future comparison.

Select three students from the class who will do the counting. One student will be asked to count at a fast speed; one will be asked to count at a medium speed; one will be asked to count at a slow speed.

Before beginning, have students estimate the time that they think it will take for each person to count to 1 million.

Have each of the volunteers count at their designated speed for three minutes. On the board, note the times and number that each of the volunteers reached.

Using multiplication, figure out how far each volunteer would have counted if allowed to count for an hour. (The 3-minute total x 20.) How far would each have counted in a day? (The hour total x 24.) A week? (The 24-hour total x 7.)

Have students consider how accurate their original estimations were.

Based on the information, have the students determine how long it would take a counter to reach 1 million. 1 billion?

5. Dickey Odds

Have students create a chart listing all of the possible combinations of a pair of dice: 1-1, 1-2, 1-3, up to 6-6. (There are 36 possible combinations.) It is important to note that the combination of 1-2 and 2-1 are different outcomes.

Two players take alternating turns tossing the pair of dice 30 times each. Choose one player to be the “even” player and one player to be the “odd” player. When the sum of the dice is even, the “even” player gets a point, when the sum is odd, the “odd” player gets a point. The player with the highest number of points after 30 rolls is the winner.

Using the chart of possible combinations, have students consider the following questions:

- How many of the combinations will add up to an even number? What is the probability of getting an even number?
- How many of the combinations will add up to an odd number? What is the probability of getting an odd number?
- Ask students if they think that the game is fair. Why or why not?

The same activity can be done using multiplication instead of addition. However, the answers to the questions will change, because in multiplication it is easier to get an even number than to get an odd number.

6. Collect All 6 Toys

Tell students to imagine that a restaurant is giving away toys with purchase. There are 6 different toys. Have students experiment with a die to help determine how many meals someone would have to buy in order to collect all 6 possible toys.

One roll of the die represents the number of the toy that they will receive. For each roll, students should make a mark on the recordkeeping sheet next to the toy that they would receive. (The number of the toy = the number on the die.) Students should keep rolling until they have collected all 6 toys. A class average is then calculated.

The probability of getting a new toy on the first roll of the die is 1. The probability of getting a new toy on the second is $\frac{5}{6}$, on the third is $\frac{4}{6}$ on the fourth roll is $\frac{3}{6}$, on the fifth roll is $\frac{2}{6}$, and the sixth roll is $\frac{1}{6}$. The probability of all 6 events occurring is $(1)(\frac{5}{6})(\frac{4}{6})(\frac{3}{6})(\frac{2}{6})(\frac{1}{6}) = \frac{120}{7776} = .0514321$.

Students should understand that in order to collect all 6 toys in six tries, they should multiply $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{46,656}$.



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Books

Berger, Bob. *Beating Murphy's Law: The Amazing Science of Risk*. Delta, 1994.

Bennett, Deborah. *Randomness*. Harvard University Press, 1998.

Lauden, Larry. *The Book of Risks: Fascinating Facts About the Chances We Take Everyday*. J. Wiley & Sons, 1994.

Internet Resources

Mathematics: Statistics and Probability

<http://explorer.scrtec.org/explorer-db/browse/static/Mathematics/browse/f81.html>

19 activities and applications to teach probability. (Also includes a worksheet to help calculate the odds of two people in class having the same birthday.)

Ask Dr. Math

<http://forum.swarthmore.edu/mathgrepform.html>

Search for "probability"

Have a K-12 math question? Ask Dr. Math. Special sections for elementary school, middle school, high school, and beyond. Site includes a link to send math questions directly to Dr. Math.

Mathematics for Fun

<http://www.thinks.com/math/index.htm>

Links to brain games, puzzles, and pastimes proving that math can be fun. Also, springboard to lists of other fun math-related activities.

Explorer Mathematics Curriculum

<http://explorer.scrtec.org/explorer-db/browse/static/Mathematics/>

"The Explorer" site is developed by the Great Lakes Collaborative and University of Kansas, and contains lesson plans and other educational math resources for K-12 teachers.

Math Lessons

<http://www.csun.edu/~vceed009/math.html>

A collection of math-related lesson plans, ideas and activities, applications, board games, puzzles and problems, and organizations.



Bill Nye the Science Guy
Lesson Planning Worksheet

Lesson Title _____

Objectives _____

Estimated Time Required _____

Materials Needed _____

Explore _____

Apply _____

Extend _____

**Principles and Standards
for School Mathematics**

Assess _____

As presentations are made, assess the quality of the student's work as thoroughly and as equitably as you possibly can. The following criteria can be used to assist in your assessment.

Name of Student _____

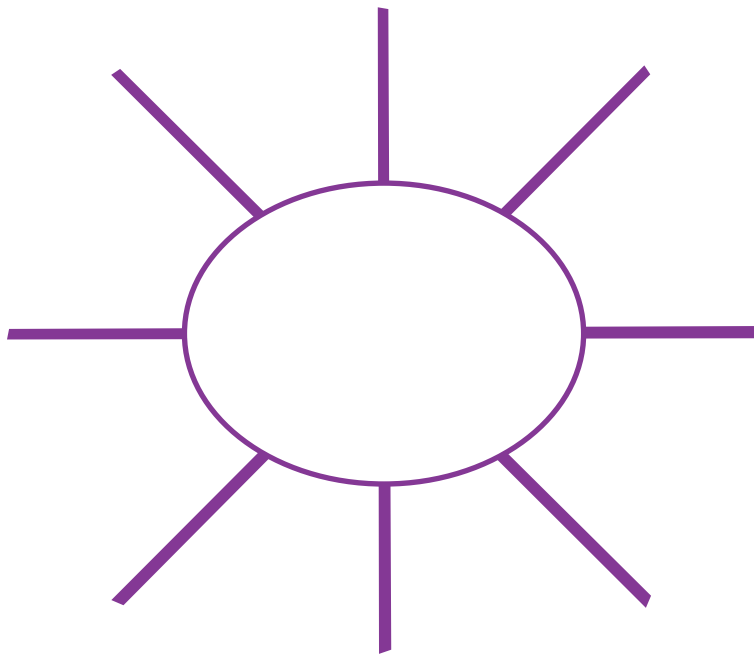
Question Investigated _____

Methods and Calculations for Finding Solutions			
1 Students do not report methods or calculations.	2 Students report methods or calculations but they are vague and incomplete.	3 Students report methods and calculations for solving the problem that are mostly complete.	4 Students report methods that are accurate and complete.
Solutions and Rationale			
1 Solutions are undefined. Rationale is not included.	2 Student solutions are incomplete and do not adequately answer the problem. Rationales are inaccurate.	3 Student solutions are complete and adequately answer the problem but rationale for additions are incomplete.	4 Student solutions are complete and include several detailed rationale for additions of time.
Illustrations			
1 Illustrations are not included.	2 Illustrations are adequate but do not connect well with the problem and solution.	3 Illustrations are integral to the problem and solution.	4 Illustrations are exceptional and visually engaging.

Bill Nye the Science Guy

Graphic Organizer

As you watch the Bill Nye clip, write down the main idea in the center of the circle.
As supporting ideas are presented write additional words or phrases on the spokes.



Bill Nye the Science Guy
Student Problem Solving Sheet

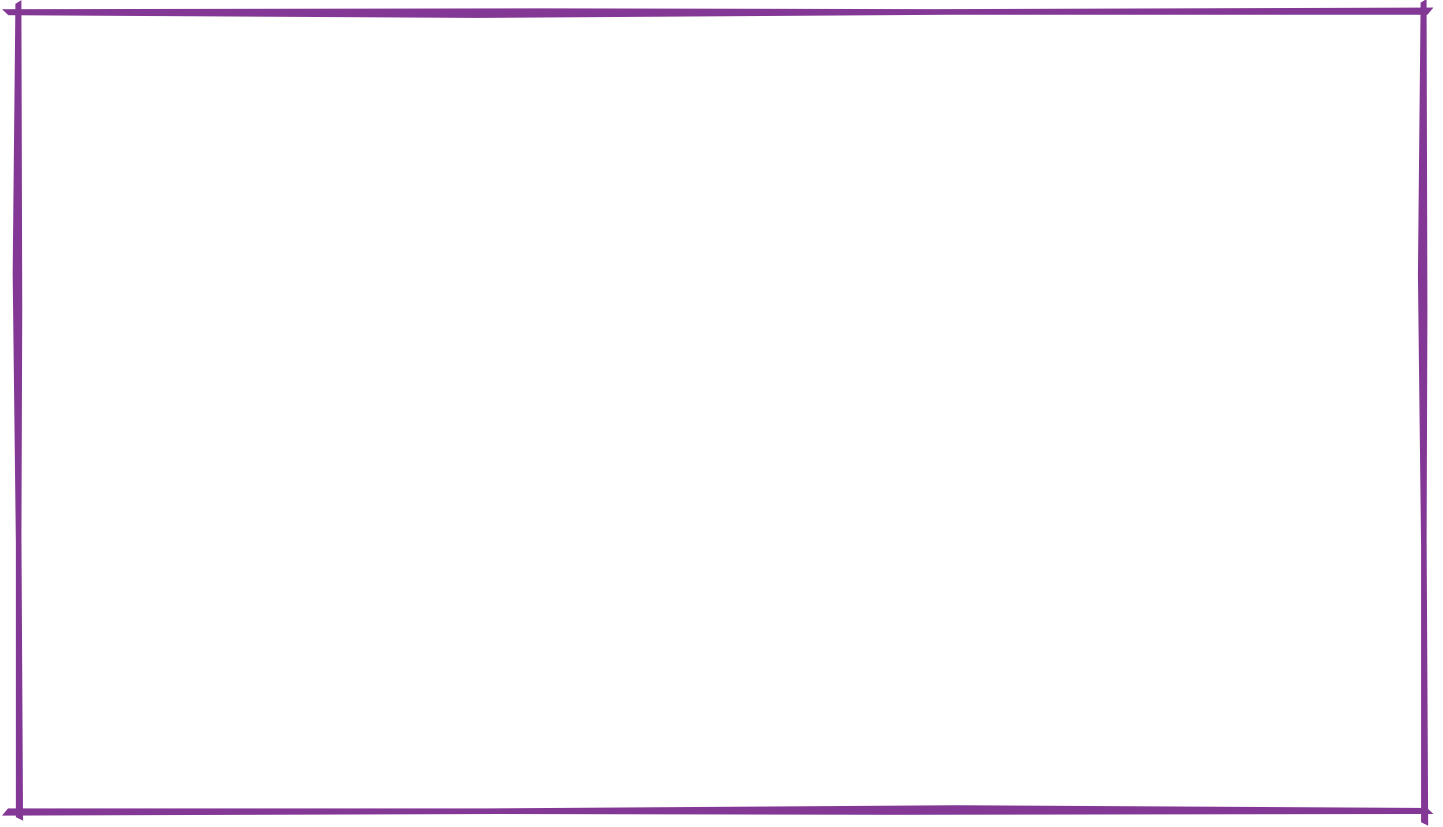
Problem Title: _____

Problem: _____

Method: (How you plan to solve the problem)

Calculations: (Solve the problem, show your work)

Illustrations: (draw a picture)



What have you learned?:

Glossary

Probability

Fold and cut to use as flashcards.

Bill Nye the Science Guy

PROBABILITY

Probability

Probability refers to the chance or possibility that something (such as a particular event or outcome) will happen or not.

Bill Nye the Science Guy

CHANCE

Chance

When a situation is uncertain, chance refers to a measure or degree of likelihood that a particular event will occur. Weather forecasters, for example, report on the chance of rain or snow in the near future.

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AVERAGE

Average

The average or mean is the sum of a set of numbers divided by the total number of items within a set. With probability, in which there is a degree of uncertainty, an average can be estimated and used to make predictions about the future.

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BELL-SHAPED CURVE

Bell-shaped curve

The bell-shaped curve refers to a common distribution pattern of a data set. Rising in the center, the curve indicates the average or mean, where most of the data ranges. At either end, there is a fairly similar tapering or decrease in data.

Fold and cut to use as flashcards.

Bill Nye the Science Guy

ODDS

Odds

Odds are a way of expressing the likelihood that a particular event or outcome is favored or will occur instead of another.

Bill Nye the Science Guy

SAMPLING

Sampling

A sampling is the act, process or research technique of selecting a representative portion of a population in order to gather information about the whole population. Through sampling, one can learn and make educated predictions.

Bill Nye the Science Guy

CHROMOSOMES

Chromosomes

Chromosomes are genes inside cells that are passed from parent to offspring. One chromosome inherited from the mother and one chromosome inherited from the father, determines whether an individual is a boy or girl; either way it is a 1 to 2 probability of being a boy or a girl.

Bill Nye the Science Guy

PREDICTION

Prediction

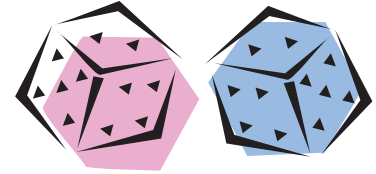
Prediction is the act of forecasting or foretelling a future event or outcome based on current observations, past experiences or reasoning. Understanding probability assists in making predictions.

Name _____

Date _____

Quiz

Probability



True or False? Circle T or F

1. The probability of winning the lottery is very high. T or F
2. There is a greater probability of a coin landing on heads than on tails. T or F
3. The probability of an individual being born as either a boy or a girl is 50 / 50. T or F
4. The closer things are to the average, the wider and more spread out the bell curve will be. T or F
5. It is harder to predict a specific combination of gumballs, such as blue followed by pink, than it is to predict just one color. T or F

Multiple Choice: Circle the letter of the best answer

6. A gumball machine has 40 blue gumballs, 30 green gumballs, 10 red gumballs, 10 pink gumballs, and 10 orange gumballs. Which color of gumball will you most likely get?
A. Pink
B. Green
C. Red
D. Blue
7. What is the probability of 2 out of 23 people having the same birthday?
A. $\frac{2}{3}$
B. $\frac{1}{23}$
C. $\frac{1}{2}$
D. 1
8. If you roll two dice, what is the most likely number you could roll?
A. 5
B. 7
C. 8
D. 11
9. If you have three doors to choose from, what is the probability you'll pick the correct door?
A. 1 in 1
B. 1 in 2
C. 1 in 3
D. 3 in 3
10. Which of the following would result in a boy being born?
A. An X chromosome from the mother and a Y chromosome from the father
B. An X chromosome from the mother and an X chromosome from your father
C. A Y chromosome from the mother and an X chromosome from your father
D. None of the above



Answer Key

Probability

1. **F**

4. **F**

7. **C**

9. **C**

2. **F**

5. **T**

8. **B**

10. **A**

3. **T**

6. **D**

PREDICTION

